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Adams County, Colorado

National Eutrophication Survey, Corvallis, Oreg

Prepared for

Corvallis Environmental Research Lab, Oreg

Jul 77

PB 278 507

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

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REPORT
ON
BARR LAKE
ADAMS COUNTY
COLORADO
EPA REGION VIII
WORKING PAPER No. 766

WITH THE COOPERATION OF THE
COLORADO DEPARTMENT OF HEALTH
AND THE
COLORADO NATIONAL GUARD
JULY, 1977

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGEMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Colorado Department of Health for professional involvement, to the Colorado National Guard for conducting the tributary sampling phase of the Survey, and to those wastewater treatment plant operators who voluntarily provided effluent samples.

The staff of the Water Quality Control Division provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

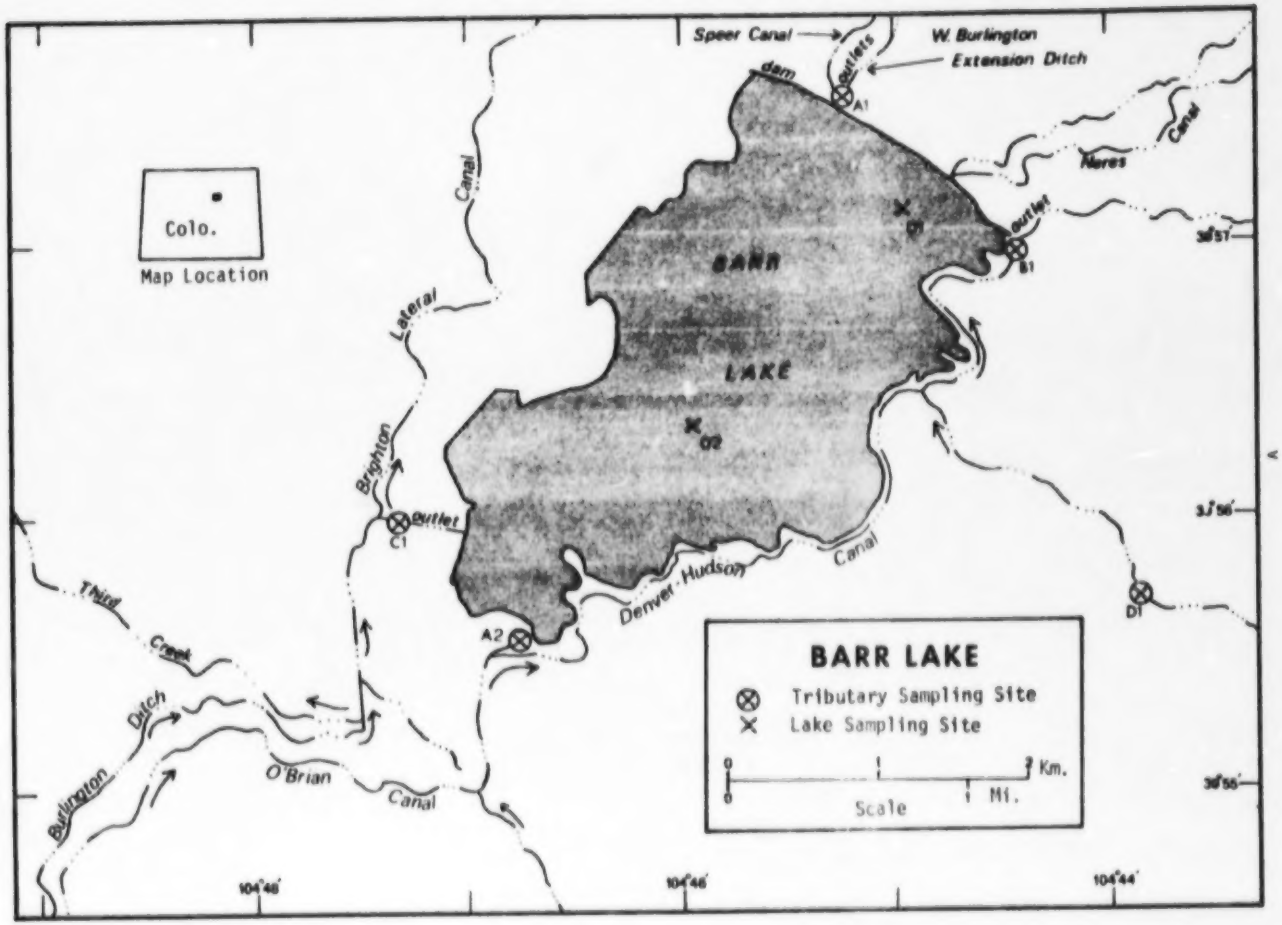
Lt. Colonel Paul A. Parsons, the Deputy Adjutant General of Colorado, and Project Officer Colonel Hershel C. Yeargan, who directed the volunteer efforts of the Colorado National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

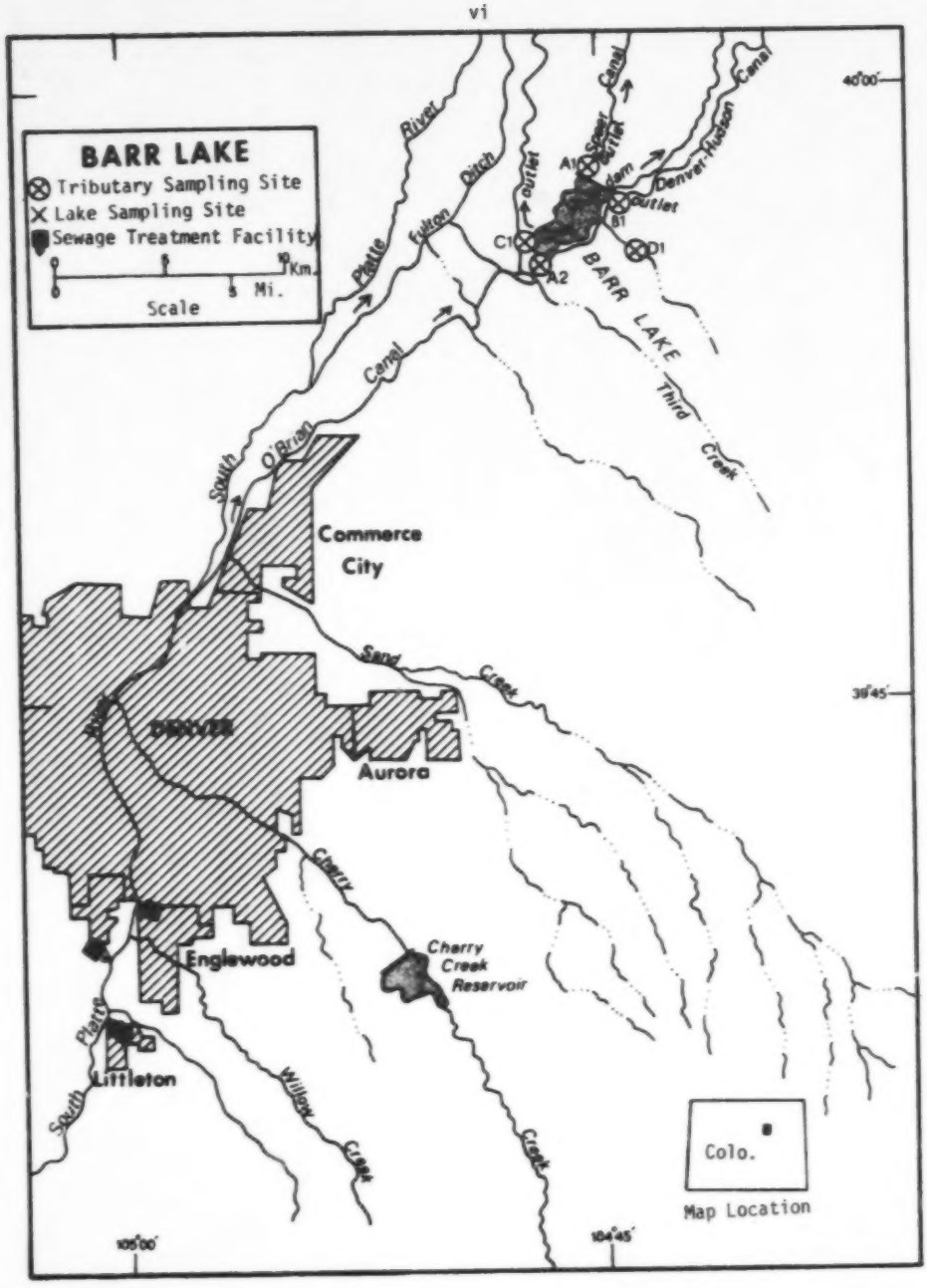
NATIONAL EUTROPHICATION SURVEY

STUDY LAKES AND RESERVOIRS

STATE OF COLORADO

NAME	COUNTY
Barker	Boulder
Barr	Adams
Blue Mesa	Boulder
Cherry Creek	Arapohoe
Cucharas	Huerfano
Dillon	Summit
Grand	Grand
Green Mountain	Summit
Holbrook	Otero
Meredith	Crowley
Milton	Weld
Navajo	Archuleta, CO; San Juan, Rio Arriba, NM
Shadow Mountain	Grand


Speer Canal
W. Burlington
Extension Ditch
dam
outlets
A1
Canal
Heres
Canal
outlet
B1
Colo.
Map Location
BARR
LAKE
Lateral
Brighton
Canal
outlet
C1
Third
Creek
Ditch
Burlington
O'Brian
Canal
Denver-Hudson
Canal
A2
D1
BARR LAKE
Tributary Sampling Site
Lake Sampling Site
Km.
Mi.
Scale
104°46'
104°46'
104°44'
39°57'
39°56'
39°55'


BARR LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Scale
Km.
Mi.
Platte River
Farmers Ditch
Outlet
Steer Outlet
Canal
Denver-Hudson Canal
Dam
Outlet
A1
B1
C1
D1
A2
BARR LAKE
Third Creek
Canal
South O'Brian
Commerce City
Sand Creek
DENVER
Aurora
Cherry
Cherry Creek Reservoir
Englewood
Platte
South
Littleton
Willow Creek
Creek
Colo.
Map Location
40°00'
39°45'
105°00'
104°45'

BARR LAKE

STORET NO. 0802

I. INTRODUCTION

Accurate flow data could not be provided for Barr Lake by the U.S. Geological Survey because water enters and leaves the reservoir through ungaged inlet and outlet canals. Therefore, this report primarily pertains to the reservoir sampling data. However, tributary and treatment plant samples were collected, and the results of analyses of the samples are presented in Appendix D.

II. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Barr Lake is eutrophic. It ranked twelfth in overall trophic quality when the 13 Colorado lakes and reservoirs sampled in 1975 were compared using a combination of six parameters*. All of the other waterbodies had less median total phosphorus, 11 had less median dissolved orthophosphorus, 11 had less median inorganic nitrogen, ten had less mean chlorophyll a, and seven had greater mean Secchi disc transparency.

Survey limnologists observed surface concentrations of algae in August and October.

B. Rate-Limiting Nutrient:

The results of the algal assay indicate that Barr Lake was

---

* See Appendix A.

nitrogen limited at the times the assay samples were collected (05/05/75 and 10/10/75).

The reservoir data indicate nitrogen limitation all three sampling times.

III. RESERVOIR AND DRAINAGE BASIN CHARACTERISTICS†

A. Morphometry††:

1. Surface area: 7.57 kilometers^2.
2. Mean depth: 5.2 meters.
3. Maximum depth: 11.9 meters.
4. Volume: 39.657 x 10^6 m^3.
5. Mean hydraulic retention time: Unknown.

B. Precipitation*:

1. Year of sampling: 42.3 centimeters.
2. Mean annual: 32.9 centimeters.

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† Table of metric equivalents--Appendix B.
†† Anderson, 1974.
* See Working Paper No. 175, "...Survey Methods, 1973-1976".

IV. WATER QUALITY SUMMARY

Barr Lake was sampled three times during the open-water season of 1975 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at two stations on the reservoir (see map, page v). During each visit, a single depth-integrated (4.6 m or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first and last visits, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 7.9 meters at station 1 and 4.9 meters at station 2.

The sampling results are presented in full in Appendix C and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR BARR LAKE
STORET CODE 0802

PARAMETER	1ST SAMPLING (5/ 5/75) 2 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (8/26/75) 2 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (10/10/75) 2 SITES RANGE	MEAN	MEDIAN
TEMP (C)	11.7 - 12.9	12.2	12.0	21.5 - 24.4	22.4	22.1	13.1 - 14.0	13.5	13.5
DISS OXY (MG/L)	7.2 - 9.2	8.6	8.8	4.8 - 16.6	8.9	7.5	7.2 - 9.0	8.2	8.1
CNDCTVY (MCROMO)	723. - 752.	736.	731.	590. - 608.	595.	591.	551. - 561.	557.	557.
PH (STAND UNITS)	8.1 - 8.4	8.3	8.2	9.0 - 9.4	9.2	9.2	8.8 - 9.0	8.9	9.0
TOT ALK (MG/L)	186. - 250.	227.	232.	149. - 156.	154.	155.	160. - 167.	162.	162.
TOT P (MG/L)	1.730 - 1.810	1.761	1.750	0.718 - 0.798	0.747	0.741	0.760 - 0.986	0.905	0.920
ORTHO P (MG/L)	1.170 - 1.730	1.517	1.640	0.492 - 0.758	0.616	0.613	0.664 - 0.770	0.700	0.680
NO2+NO3 (MG/L)	1.420 - 2.140	1.573	1.470	0.020 - 0.090	0.047	0.045	0.150 - 0.170	0.160	0.160
AMMONIA (MG/L)	1.390 - 7.310	5.943	6.510	0.030 - 0.260	0.093	0.060	0.820 - 1.690	1.022	0.895
KJEL N (MG/L)	6.500 - 8.300	7.371	7.300	1.400 - 2.900	1.717	1.450	2.000 - 3.600	2.750	2.650
INORG N (MG/L)	3.530 - 8.730	7.516	7.980	0.050 - 0.320	0.140	0.100	0.980 - 1.850	1.182	1.055
TOTAL N (MG/L)	8.010 - 9.850	8.944	8.770	1.440 - 2.920	1.763	1.525	2.170 - 3.760	2.910	2.810
CHLRPYL A (UG/L)	4.3 - 12.8	8.5	8.5	29.0 - 74.4	51.7	51.7	19.6 - 32.5	26.0	26.0
SECCHI (METERS)	1.8 - 3.0	2.4	2.4	0.3 - 0.6	0.5	0.5	0.6 - 1.0	0.8	0.8

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
05/05/75	1. Chroomonas sp.	1,148
	2. Cryptomonas sp.	836
	3. Schroederia sp.	313
	4. Cysts	52
	Total	2,349
08/26/75	1. Aphanizomenon sp.	3,265
	2. Gomphosphaeria sp.	96
	3. Microcystis sp.	96
	4. Phormidium sp.	48
	Total	3,505
10/10/75	1. Aphanizomenon sp.	1,012
	2. Melosira sp.	156
	3. Microcystis sp.	78
	4. Nitzschia sp.	78
	5. Chroomonas (?) sp.	78
	Total	1,402

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/05/75	1	4.3
	2	12.8
08/26/75	1	14.4
	2	29.0
10/10/75	1	32.5
	2	19.6

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. May sample -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	1.350	6.040	186.3
0.050 P	1.400	6.040	175.2
0.050 P + 1.0 N	1.400	7.040	228.6
1.0 N	1.350	7.040	210.1

b. October sample -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.630	1.120	42.8
0.050 P	0.680	1.120	42.0
0.050 P + 1.0 N	0.680	2.120	71.4
1.0 N	0.630	2.120	71.0

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential primary productivity of Barr Lake was very high at the times the assay samples were collected (05/05/75 and 10/10/75). Also, the significant growth response in both assays to the addition of nitrogen alone and the lack of response when only phosphorus was added indicate nitrogen was limiting at those times.

The reservoir data indicate nitrogen limitation all three sampling times. The mean inorganic nitrogen to orthophosphorus ratios were 5 to 1 in May, <1 to 1 in August, and 2 to 1 in October; and nitrogen limitation would be expected.

V. Waste Sources:

1. Known municipal* -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Littleton	55,000	tr. filter	15,772.5	South Platte R.
South Lakewood	16,500	act. sludge	6,158.6	South Platte R.
Englewood	85,000	act. sludge	33,646.0	South Platte R.

2. Known industrial - None

* Treatment plant questionnaires.

VI. Mean Nutrient Concentrations in Ungaged Streams:

Tributary	Mean Total P Conc. (mg/l)	Mean Total N Conc. (mg/l)
Speer Canal	1.664	6.565
O'Brian Canal	1.960	7.701
Denver-Hudson Canal	2.441	6.851
Unnamed Ditch (C-1)	0.270	1.855
Unnamed Stream (D-1)	1.611	5.861

VII. LITERATURE REVIEWED

Anderson, R. Dennis, 1974. Personal communication (waterbody information and morphometry). CO Dept. of Health, Denver.

VIII. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN OD	MEDIAN DISS ORTHO P
0801	BARKER RESERVOIR	0.023	0.045	419.000	5.333	9.400	0.006
0802	BARR LAKE	0.930	1.090	451.333	28.767	10.200	0.730
0803	BLUE MESA RESERVOIR	0.019	0.040	395.750	6.817	13.800	0.005
0804	CHERRY CREEK LAKE	0.054	0.040	469.333	23.322	10.000	0.007
0805	CUCHARAS RESERVOIR	0.263	0.040	490.000	27.400	14.800	0.015
0806	DILLON RESERVOIR	0.009	0.040	181.750	3.150	9.200	0.002
0807	GRAND LAKE	0.013	0.040	366.500	4.900	10.200	0.003
0808	GREEN MOUNTAIN RESERVOIR	0.010	0.040	391.167	5.833	9.100	0.002
0809	HOLBROOK LAKE	0.329	0.070	490.333	111.933	9.000	0.028
0810	LAKE MEREDITH	0.397	0.110	489.667	164.678	10.400	0.098
0811	MILTON RESERVOIR	0.846	2.280	429.333	5.900	9.200	0.808
0812	NAVAJO RESERVOIR	0.036	0.050	479.400	2.180	10.000	0.013
0813	SHADOW MOUNTAIN LAKE	0.020	0.040	427.000	5.700	9.200	0.003

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	SDD-MEAN SEC	MEAN CHLORA	1S-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
0801	BARKER RESERVOIR	58 (7)	42 (5)	67 (8)	75 (9)	58 (7)	58 (7)	358
0802	BARR LAKE	0 (0)	8 (1)	42 (5)	17 (2)	29 (3)	8 (1)	104
0803	BLUE MESA RESERVOIR	75 (9)	87 (9)	75 (9)	42 (5)	8 (1)	67 (8)	354
0804	CHERRY CREEK LAKE	42 (5)	87 (9)	33 (4)	33 (4)	46 (5)	50 (6)	291
0805	CUCHARAS RESERVOIR	33 (4)	58 (6)	8 (1)	25 (3)	0 (0)	33 (4)	157
0806	DILLON RESERVOIR	100 (12)	58 (6)	100 (12)	92 (11)	75 (8)	96 (11)	521
0807	GRAND LAKE	83 (10)	87 (9)	92 (11)	83 (10)	29 (3)	79 (9)	453
0808	GREEN MOUNTAIN RESERVOIR	92 (11)	58 (6)	83 (10)	58 (7)	92 (11)	96 (11)	479
0809	HOLBROOK LAKE	25 (3)	25 (3)	0 (0)	8 (1)	100 (12)	25 (3)	183
0810	LAKE MEREDITH	17 (2)	17 (2)	17 (2)	0 (0)	17 (2)	17 (2)	85
0811	MILTON RESERVOIR	8 (1)	0 (0)	50 (6)	50 (6)	75 (8)	0 (0)	143
0812	NAVAJO RESERVOIR	50 (6)	33 (4)	25 (3)	100 (12)	46 (5)	42 (5)	296
0813	SHADOW MOUNTAIN LAKE	67 (8)	87 (9)	58 (7)	67 (8)	75 (8)	79 (9)	433

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	0806	DILLON RESERVOIR	521
2	0808	GREEN MOUNTAIN RESERVOIR	479
3	0807	GRAND LAKE	453
4	0813	SHADOW MOUNTAIN LAKE	433
5	0801	BARKER RESERVOIR	358
6	0803	BLUE MESA RESERVOIR	354
7	0812	NAVAJO RESERVOIR	296
8	0804	CHERRY CREEK LAKE	291
9	0811	MILTON RESERVOIR	183
10	0809	HOLBROOK LAKE	183
11	0805	CUCHARAS RESERVOIR	157
12	0802	BARR LAKE	104
13	0810	LAKE MEREDITH	85

14

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/09/24

080201
39 56 27.0 104 44 53.0 3
BARR LAKE
08001 COLORADO
091091

11EPALES 2111202
0030 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/05	14 20	0000	12.7	8.4	120	752	8.15	250	6.460	6.500	1.510	1.170
	14 20	0005	12.8	8.4		749	8.15	226	7.310	7.000	1.420	1.250
	14 20	0015	12.9	8.8		749	8.20	232	6.510	6.900	1.470	1.680
	14 20	0026	12.0	7.2		731	8.20	234	7.160	7.300	1.470	1.730
75/08/26	13 35	0000	24.4	16.6	12	608	9.40	149	0.040	2.900	0.020K	0.492
	13 35	0005	22.2	7.6		591	9.30	154	0.030	1.700	0.020K	0.586
	13 35	0015	21.6	4.8		591	9.00	156	0.260	1.400	0.060	0.632
75/10/10	11 30	0000	13.7	8.6	24	557	8.80	161	0.970	3.600	0.160	0.664
	11 30	0005		8.0		554	8.90	162	0.860	2.800	0.160	0.680
	11 30	0015	13.3	8.2		551	9.00	164	0.820	2.500	0.160	0.680

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/05	14 20	0000	1.780	4.3	
	14 20	0005	1.750		
	14 20	0015	1.740		
	14 20	0026	1.770		
75/08/26	13 35	0000	0.798	74.4	
	13 35	0005	0.728		
	13 35	0015	0.756		
75/10/10	11 30	0000	0.900	32.5	
	11 30	0005	0.910		
	11 30	0015	0.944		

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/09/24

080202
39 56 27.0 104 45 48.0 3
BARR LAKE
08001 COLORADO
041091

11EPALES 2111202
0016 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/05	14	55 0000	11.7	9.2	72	723	8.40	234	6.180	8.300	1.550	1.660
	14	55 0005	11.8	9.0		724	8.35	228	6.590	7.900	1.450	1.490
	14	55 0012	11.7	9.2		723	8.35	186	1.390	7.700	2.140	1.640
75/08/26	13	40 0000	22.5	9.6	24	598	9.25	153	0.030	1.400	0.040	0.600
	13	40 0005	22.0	7.2		591	9.15	156	0.080	1.400	0.050	0.626
	13	40 0010	21.5	7.4		590	9.10	155	0.120	1.500	0.090	0.758
75/10/10	11	15 0000	14.0	9.0	40	561	9.00	167	0.870	2.200	0.150	0.678
	11	15 0005	13.5	8.0		556	9.00	160	0.920	2.000	0.170	0.770
	11	15 0016	13.1	7.2		560	9.00	160	1.690	3.400	0.160	0.730

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/05	14	55 0000	1.750	12.8	
	14	55 0005	1.810		
	14	55 0012	1.730		
75/08/26	13	40 0000	0.718	29.0	
	13	40 0005	0.730		
	13	40 0010	0.752		
75/10/10	11	15 0000	0.760	19.6	
	11	15 0005	0.930		
	11	15 0016	0.986		

19

APPENDIX D

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/09/24

080241
39 57 32.0 104 45 17.0 4
SPEER CANAL
08 7.5 BRIGHTON
U/SRR LAKE 091091
BNK 20 FT NE OF RD GOING OVER DAM
11EPALES 211204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/29			1.540	22.000	12.600	3.400	6.900
75/02/24	10 05		1.360	7.500	5.100	1.680	1.850
75/03/19	09 20		0.008	1.000	0.024	0.024	0.100
75/04/30	11 30		0.620	1.650	0.860	0.250	0.340
75/05/15	10 45		0.900	4.400	2.400	0.860	0.960
75/05/28	11 30		1.300	5.100	2.630	1.450	
75/06/30	13 00		1.100	3.480	0.285	0.390	1.550
75/07/09	11 00		0.710	3.700	1.700	1.250	1.250
75/07/21	09 00		1.200	1.510	0.420	0.725	0.780
75/08/01	10 20		0.375	6.200	0.026	0.810	1.250

STORET RETRIEVAL DATE 76/09/24

080242
39 55 35.0 104 46 50.0 4
O'BRIAN CANAL
08 7.5 BRIGHTON
T/BARR LAKE 091091
BNK 400 FT DnSTRM FRM SEC RD
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/09/28	11	35	1.320	10.300	8.100	1.350	1.500
74/11/29			1.840	13.500	11.000	4.100	6.500
75/01/30	10	00	1.830	17.500	10.500		4.800
75/02/24	09	37	4.000	4.900	2.600	1.200	1.500
75/03/19	09	00	1.400	14.000	9.850	3.550	4.400
75/04/30	10	00	1.570	5.600	1.650	1.100	1.550
75/05/15	09	15	0.070	7.067	1.150	0.990	1.580
75/05/28	10	00	0.090	1.100	0.100	0.170	0.330
75/06/30	11	10	1.250	3.100	0.230	0.400	0.560
75/07/09	10	00	0.260	1.200	0.125	0.310	0.480
75/07/21	11	00	0.620	2.600	0.110	0.130	0.790
75/08/01	10	05	0.290	1.400	0.050	0.105	0.440
75/08/11	10	00	0.010	3.300	0.020	0.640	1.050

STORET RETRIEVAL DATE 76/09/24

08U251
39 57 00.0 104 44 30.0 4
DEN.ER-HUDSON CANAL
08 7.5 MI HIGH LKS
O/BARR LAKE 091091
BNK 300 FT S OF RD GOING OVER DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/29			1.840	14.000	9.800	3.300	6.300
75/01/30	12 05		1.555	6.750	2.300	1.530	1.615
75/04/30	10 30		1.150	6.500	4.950	1.650	1.750
75/05/15	11 00		0.070	5.690	4.000	2.200	4.260
75/05/28	11 20		1.250	4.900	2.400	1.500	1.500
75/06/30	12 00		0.810	3.450	1.760	1.200	1.250
75/07/09	12 35		0.050	2.400	0.040	0.930	1.350
75/07/21	10 00		0.690	3.700	0.035	0.115	1.500

STORET RETRIEVAL DATE 75/09/24

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                                                    080201
                                                    39 56 00.0 104 47 30.0 4
                                                    UNNAMED DITCH
                                                    08       7.5 BRIGHTON
                                                    I/BARR LAKE                    041041
                                                    SEC RD BRDG .2 MI S OF I 80 S JCT
                                                    11EPALES                      2111204
                                                     0000 FEET  DEPTH  CLASS 00
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DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
75/01/30	09 45		0.096	0.923	0.165	0.041	0.060
75/02/24	09 45		0.055	0.400	0.040	0.016	0.030
75/03/19	08 55		0.055	1.000	0.135	0.020	0.030
75/04/30	11 15		0.005	0.550	0.050	0.025	0.040
75/05/15	09 00		0.020	0.850	0.055	0.032	0.050
75/05/28	09 40		1.350	5.200	3.150	1.450	1.450
75/06/30	10 45		0.015	0.700	0.030	0.040	0.040
75/07/09	10 30		1.900	1.150	0.055	0.115	0.230
75/07/21	10 30		0.010	1.125	0.045	0.055	0.155
75/08/01	09 55		1.650	1.500	0.180	0.375	0.620

STORET RETRIEVAL DATE 76/09/24

080201
39 55 45.0 104 43 50.0 4
UNNAMED STREAM
08 7.5 MI HIGH LKS
T/BARR LAKE 091091
SEC RD XING 4 MI E OF I 80 S JCT
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
75/01/30	11 25		2.300	12.000	8.900	2.450	3.300
75/05/28	10 31		0.390	6.100	0.830	1.570	2.400
75/06/30	11 00		0.900	3.750	2.000	1.200	1.270
	11 30		1.300	1.350	0.510	0.590	0.705
75/08/01	10 30		0.155	1.050	0.020	0.030	0.380

STORET RETRIEVAL DATE 76/09/24

08021E
39 53 20.0 104 37 55.0 4
UNNAMED STREAM
08 7.5 MI HIGH LKS
T/HARR LAKE 091091
SEC 4D AING JUST E OF PATTON RANCH
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/29				24.000			14.400
75/03/19	10 00		1.050	20.000	8.000	3.150	3.900
75/05/28	10 55		0.250	9.700	3.700	1.800	2.200
75/06/30	12 30		0.960	3.300	1.700	1.150	1.270

STORET RETRIEVAL DATE 76/09/24

0802AA AS0802XA P055000
39 36 10.0 105 01 00.0 4
LITTLETON
09005 7.5 ARVADA
T/BARR RES
S. PLATTE RIVER TO CANAL
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/01/31	10 00								
CP(T)-			0.560	26.000	11.600	7.200	9.100	3.600	3.800
75/01/31	15 00								
75/02/28	10 00								
CP(T)-			0.640	26.000	12.500	7.000	8.300	3.500	3.800
75/02/28	14 00								
75/03/31	10 00								
CP(T)-			0.480	23.000	14.400	8.300	10.000	3.900	3.900
75/03/31	14 00								
75/04/24	10 00								
CP(T)-			0.450	33.000	16.500	7.100	9.500	4.000	3.900
75/04/24	14 00								
75/05/07	10 00								
CP(T)-			1.400	23.000	8.700	5.800	7.600	4.000	3.900
75/05/07	14 00								
75/05/29	10 00								
CP(T)-			1.550	19.500	8.400	4.200	4.700	4.100	4.000
75/05/29	14 00								
75/06/16	10 00								
CP(T)-			1.450	18.000	5.600	2.800	7.575	4.200	4.100
75/06/16	14 00								
75/07/03	10 00								
CP(T)-			1.250	19.500	4.300	5.400	7.200	4.500	4.500
75/07/03	14 00								
75/08/18	10 00								
CP(T)-			0.700	18.000	4.700	5.500	6.700	5.200	4.900
75/08/18	14 00								
75/09/02	10 00								
CP(T)-			0.425	19.000	6.000	6.500	7.800	4.400	4.200
75/09/02	14 00								
75/09/25	10 00								
CP(T)-			0.650	23.500	9.100	5.000	5.700	4.600	4.500
75/09/25	14 00								
75/09/30	10 00								
CP(T)-			0.350	22.000	6.900	2.600	7.400	5.000	4.500
75/09/30	14 00								

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STORET RETRIEVAL DATE 76/04/24

0802AB A50802AB P085000
39 39 45.0 105 01 45.0 4
ENGLE#000
08 7.5 LAFAYETTE
T/BARR RES 041091
S. PLATTE RIVER TO CANAL
11EPALES 214120
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/01/22	08	00							
CP(T)-			0.240	39.000			7.500	8.500	8.900
75/01/22	20	00							
75/02/26	00	00							
CP(T)-			0.240	33.500	17.300	8.000	10.000	7.360	7.600
75/02/26	24	00							
75/03/20	00	00							
CP(T)-			0.240	14.500	13.600	9.700	9.700	7.430	7.630
75/03/20	24	00							
75/04/22	00	00							
CP(T)-			0.150	32.000	17.300		10.500	8.840	8.500
75/04/22	24	00							
75/05/08	00	00							
CP(T)-			0.300	36.000	27.000	5.200	10.500	7.960	8.500
75/05/08	24	00							
75/05/29	00	00							
CP(T)-			0.250	27.000	19.000	6.900	7.900	9.590	8.150
75/05/29	24	00							
75/06/23	00	00							
CP(T)-			0.200	33.000	15.000	8.700	10.500	8.500	9.510
75/06/23	24	00							
75/07/09	00	00							
CP(T)-			0.200	25.000	10.500	6.700	8.800	9.610	9.350
75/07/09	24	00							
75/07/31	00	00							
CP(T)-			0.625	23.000	11.000	6.600	8.100	10.500	9.780
75/07/31	24	00							
75/08/20	00	00							
CP(T)-			1.800	22.000	6.800	6.500	7.900	10.500	10.600
75/08/20	24	00							
75/09/10	00	00							
CP(T)-			0.050	20.000	7.600	7.100	7.800	9.000	9.000
75/09/10	24	00							
75/10/02	00	00							
CP(T)-			0.125	26.000	12.000	7.400	8.700	8.490	9.140
75/10/02	24	00							

STORET RETRIEVAL DATE 76/09/24

08025C AS0802XC P016500
39 45 00.0 105 04 30.0 4
SOUTH LAKE,000
08 7.5 KASSLER
T/BARR RES. 091091
S.PLATTE RIVER
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/01/16			0.240	25.000	10.000	6.375	7.500	1.200	1.200
75/02/13 00 00 CP(T)-			0.065	24.000	10.000	5.160	9.300	1.200	1.200
75/02/13 06 00									
75/03/04 18 00			0.080	24.000	10.400	8.600	9.100	1.200	1.200
75/04/22 00 00 CP(T)-			0.500	16.000	3.700	4.500	5.300	1.400	1.300
75/04/22 06 00									
75/05/22 00 00 CP(T)-			0.100	21.000	5.000	4.700	5.800	1.500	1.400
75/05/22 06 00									
75/06/05 00 00 CP(T)-			0.050	14.500	1.800	1.750	2.550	1.900	1.700
75/06/05 06 00									
75/06/12 00 00 CP(T)-			0.050	14.000	3.900	5.300	6.300	2.000	2.100
75/06/12 06 00									
75/07/02 00 00 CP(T)-			0.100	21.000	5.550	4.250	5.100	1.800	1.800
75/07/02 06 00									
75/07/22 00 00 CP(T)-			0.050	28.000	3.200	3.400	5.100	1.900	2.000
75/07/22 06 00									
75/08/07 00 00 CP(T)-			1.900	15.500	2.700	5.000	5.800	1.800	1.900
75/08/07 06 00									
75/08/26 00 00 CP(T)-			0.050	14.000	4.200	3.100	3.900	1.800	2.000
75/08/26 06 00									
75/09/16 00 00 CP(T)-			0.025	24.000	6.100	9.300	11.000	1.700	1.750
75/09/16 06 00									
75/10/17 00 00			0.075	26.000	10.250	9.550	11.500	1.400	1.600